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June 20, 1994

Mr. William A. Caton  
Secretary  
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Washington, DC 20554

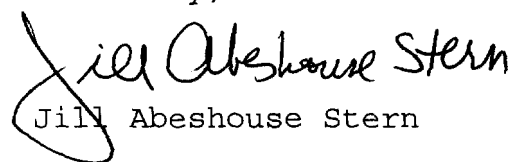
Re: CC Docket No. 92-166

Dear Mr. Caton:

On behalf of Ellipsat Corporation, I am transmitting here-  
with an original and five copies of its reply comments with  
respect to the Notice of Proposed Rulemaking in the  
above-referenced proceeding (Amendment of the Commission's Rules  
and Policies Pertaining to a Mobile Satellite Service in the  
1610-1626.5/2483.5-2500 MHz Frequency Bands.)

Should there be any questions concerning this matter, kindly  
communicate with the undersigned.

Sincerely,

  
Jill Abeshouse Stern

Enclosures

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Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
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| In the Matter of                | ) |                      |
|                                 | ) |                      |
| Amendment of the Commission's   | ) |                      |
| Rules to Establish Rules and    | ) | CC Docket No. 92-166 |
| Policies Pertaining to a Mobile | ) |                      |
| Satellite Service in the        | ) |                      |
| 1610-1626.5/2483.5-2500 MHz     | ) |                      |
| Frequency Bands                 | ) |                      |

REPLY COMMENTS OF  
ELLIPSAT CORPORATION

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June 20, 1994

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## SUMMARY

The opening comments in this proceeding provide a firm basis for the Commission to move forward expeditiously with adoption of appropriate rules and licensing of the pending MSS Above 1 GHz systems. All of the LEO applicants agree that the spectrum sharing plan proposed by the Commission establishes a workable approach for providing each system with sufficient spectrum to get started.

The comments identify a number of outstanding issues that still need to be addressed, most notably, the need for (1) GLONASS relocation below 1610 MHz; (2) appropriate intra-service coordination requirements; (3) sufficient feeder link spectrum below 15 GHz; (4) full use of the allocated 16.5 MHz of S-Band downlink spectrum; (5) adoption of qualification standards that accommodate diverse market/technical approaches, including a financial standard based on the portion of the system needed to introduce commercial service in the United States; (6) service rules that facilitate rapid technology insertion; and (7) exclusion of the geostationary MSS applicant.

Based on the opening comments, however, Ellipsat believes that all of these issues can be addressed to the satisfaction of the LEO applicants and the public interest. This represents a major achievement for which the Commission should be commended.

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Frequency Bands )

REPLY COMMENTS OF  
ELLIPSAT CORPORATION

Ellipsat Corporation ("Ellipsat"), by its attorneys, submits its reply comments with respect to the Notice of Proposed Rulemaking ("Notice") in the above-captioned proceeding.<sup>1/</sup>

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<sup>1/</sup> 9 F.C.C. Rcd. 1094 (1994).

## I. INTRODUCTION AND SUMMARY

In this proceeding, the Commission proposes to adopt rules and policies governing the Mobile Satellite Service ("MSS") Above 1 GHz. On May 5, 1994, Ellipsat provided detailed comments with respect to the Notice's proposals, including the proposed spectrum sharing plan, qualification standards, and technical and service rules for MSS Above 1 GHz. As the first applicant for a low-Earth-orbit (LEO) mobile satellite system, with an application pending since November 1990, Ellipsat urged the Commission to move forward expeditiously with adoption of appropriate rules and licensing of the LEO systems.

While the comments addressed a wide variety of issues, adoption of a workable spectrum sharing plan for the CDMA and FDMA/TDMA systems continues to be the central issue in this proceeding. On this critical issue, Ellipsat and all of the LEO applicants endorse the Commission's proposed band segmentation approach, subject to certain conditions, in the interest of facilitating expeditious implementation of the LEO systems.

Ellipsat's parent, Mobile Communications Holdings, Inc. ("MCHI") and MCHI's strategic partners in the ELLIPSO™ system, including Westinghouse Electric Corporation, Harris Corporation, InterDigital Corporation and Fairchild Space, have made a substantial commitment to ELLIPSO™ and are poised to move forward rapidly with system development upon resolution of the outstanding issues in this proceeding. For these strategic partners, and others who are making critical business and





technical decisions involving the Big LEOs, the prompt adoption of an equitable sharing plan that provides all systems with an opportunity to get started is imperative.<sup>2/</sup>

Significantly, no party in this proceeding has flatly rejected the Commission's sharing plan. To the contrary, all of the key parties support the Commission's band segmentation plan as a workable approach. Although various caveats and conditions are noted in the comments, all of the LEO applicants have indicated an ability and willingness to work within the proposed sharing plan. This is a major achievement and provides a basis for moving forward rapidly with adoption of appropriate rules and licensing of the LEO systems.

Despite this virtual consensus on the sharing issue, there are a number of other important issues that must be addressed in the final Order and reflected in the rules. While Ellipsat is confident that these issues can be resolved, it is important that the Commission utilize this opportunity to alleviate potential problems that could preclude timely implementation of the LEO systems. The significant outstanding issues and the majority position with respect to each issue are summarized below:

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<sup>2/</sup> See Comments of Harris Corporation (May 5, 1994); Comments of Fairchild Space and Defense Corporation (May 5, 1994); and Comments of Westinghouse Electric Corporation (May 5, 1994).

1. **GLONASS.** All parties agree (with the minor exception of certain aviation equipment manufacturers) that GLONASS must be relocated below 1610 MHz. While there are differences on how the spectrum should be shared in the event that GLONASS continues to burden the spectrum, and recognition that it would seriously impede the productive use of that spectrum, there is general agreement that the United States should vigorously pursue bilaterally with the Russian Federation the relocation of GLONASS below 1610 MHz and take appropriate action at WRC-95 and otherwise vigorously pursue the relocation of GLONASS below 1610 MHz and the adoption of whatever international rule changes may be required. At the same time, the Commission should not adopt protection requirements for GLONASS that go beyond international requirements;

2. **Feeder Link Spectrum.** Sufficient feeder link spectrum below 15 GHz must be made available to support the LEO systems through specific allocations or reverse band sharing which appears to be a particularly promising approach. This is of particular importance to systems using multiple ground switching networks. The Commission should make appropriate allocations and seek international allocations at WRC-95 to permit reverse band

feeder link operations in the fixed satellite bands below 15 GHz.<sup>3/</sup>

3. **Non-Geostationary Systems.** The comments provide abundant evidence supporting the Commission's proposal to require non-geostationary architecture as a threshold criterion. The comments overwhelmingly agree that this limitation will encourage implementation of new and innovative global LEO services, foster competitive entry, and facilitate coordination in the limited spectrum available for LEOs.

4. **Intra-Service Coordination.** All of the LEOs agree that the Commission should mandate intra-service coordination between the LEO systems as outlined in the January 5, 1993 Joint Proposal submitted by TRW, Ellipsat and Constellation. The comments urge the Commission to take an active role in facilitating coordination by, for example, adopting coordination milestones and "default" criteria that, if met, will be deemed evidence of successful coordination;

5. **S-Band.** Access to the entire 16.5 MHz of allocated S-band frequencies for LEO downlinks on a full-band sharing basis is critical for efficient operation of the CDMA systems;

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<sup>3/</sup> Ellipsat will reiterate this recommendation in its comments in response to the Notice of Inquiry in preparation for WRC-95 (In the Matter of Preparation for International Telecommunication Union World Administrative Radio Conference, IC Docket No. 94-31, FCC 94-96, released May 5, 1994).

6. **Coverage Requirements.** All of the LEO parties support the concept of global and U.S. coverage requirements. However, some adjustments, including increases in elevation angles and revised latitudes, are needed to ensure that the requirements are meaningful in terms of providing service to populated areas. While varying geographical standards have been proposed, The ELLIPSO™ system's formulation (i.e., 55° southern and 75° northern latitudes) is rationally based on location of population, from the southern tip of South America to the northernmost point in Alaska. Motorola's solitary and self-serving attempt to inject an unjustified ground infrastructure requirement, into the coverage standard, should be flatly rejected.

7. **No Minimum Channel Requirements.** With the exception of Loral, all of the LEO applicants agree with the Commission that minimum channel or efficiency requirements are inappropriate for a new service like the Big LEOS;

8. **Revised Financial Standard.** A majority of the LEO applicants agree with Ellipsat that the strict domsat financial standard is inappropriate for a new and commercially unproven service like the Big LEOS particularly where the spectrum-sharing plan can accommodate all of the systems. Three of the LEO applicants have supported the approach used in the Non-voice Non-geostationary (NVNG) MSS, i.e., domsat standard applied to the minimum number of satellites needed to provide commercial

service. Commercial service should be defined as 50% availability in the United States (i.e., 12-14 hours of continuous service available during daylight hours).<sup>4/</sup> Ellipsat reiterates that, in any case, if the domsat standard is adopted, the same standard of irrevocable commitment of funds should apply to all applicants, including those relying on current assets;

9. **System Upgrades.** All of the LEO comments (with the single exception of TRW) agree that greater flexibility must be provided to permit more rapid insertion of advanced technology and system upgrades during the license term and to incorporate modifications that do not affect coordination with other systems or services;<sup>5/</sup>

10. **Reassignment of Spectrum.** All of the CDMA systems urged the Commission to address the current inequity in the proposed rules, and provide for reassignment of TDMA/FDMA spectrum if that spectrum is not used. The Commission should also define with greater specificity the circumstances under which spectrum will be reassigned.

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<sup>4/</sup> The rule change recommended by Ellipsat is attached as Exhibit A.

<sup>5/</sup> Changes to proposed rule 25.143(c) to achieve this objective are provided at Exhibit A.

II. THE COMMENTS GENERALLY SUPPORT THE  
PROPOSED SHARING PLAN AS A WORKABLE APPROACH

A. The Comments Reflect Broad Support For  
The Proposed Band Segmentation Approach

The opening comments reflect broad support for the Commission's proposal to set aside specific frequencies for different access techniques. Under this approach, CDMA systems will be assigned 11.35 MHz of spectrum (1610-1621.35 MHz) and FDMA/TDMA systems will be assigned 5.15 MHz of spectrum (1621.35-1626.5 MHz).

All of the LEO applicants have indicated that this spectrum sharing plan is workable and provides a basis for the systems to move forward with system design and implementation. Willingness to accept the Commission's L-Band assignment plan is based largely on the views of all parties that unless mutual exclusivity is resolved through acceptance of the proposed sharing plan, an alternative (and potentially disastrous) selection scheme will need to be employed. The parties are unanimous in their belief that lotteries, auctions or comparative hearings could preclude successful system implementation.

A number of parties have expressed reservations about the sharing plan, based on the fact that all parts of the 1610-1626.5 MHz band are not equally desirable because of GLONASS and radioastronomy operations in the lower portion of the band. On balance, however, Ellipsat shares the view expressed by others in

this proceeding that expeditious resolution of the outstanding mutual exclusivity issue is important if the promise offered by the Big LEO systems is ever to be realized. For this reason, Ellipsat is willing to work within the Commission's band segmentation plan subject to certain critical conditions which must be satisfactorily addressed in the Commission's final Order. Ellipsat believes that this plan and its acceptance by the LEO applicants represents major progress in this proceeding.

B. The GLONASS Issue Must Still Be Resolved

All of the LEO systems agree that GLONASS must be relocated below 1610 MHz. There is no question but that the GLONASS issue must be resolved as the applicants, after licensing, proceed through construction to launch. A policy of continued protection to GLONASS above 1610 MHz would constrict the available usable spectrum to the point where serious questions are raised as to whether a successful service and business can be created.

From this, it is clear to Ellipsat that at a minimum:

(a) The Commission and the applicants must continue to take concerted action to seek the relocation of GLONASS below 1610 MHz. The Commission must send a strong message to appropriate government policymakers on the need for GLONASS relocation and the importance of this relocation for future LEO implementation. GLONASS relocation is the strongly preferred

option and should be pressed, if needed, at senior levels of the Russian government as both a trade and political issue;

(b) While GLONASS relocation is critical, Ellipsat recognizes that this may not be accomplished within the relevant time frame. The Commission should therefore adopt an orderly and enforceable mechanism for "sharing the burden" by identifying the principles which will govern the operation of the mechanism (i.e.,  $1/N$  where  $N$  is the number of applicants who have met all milestones and are ready to launch) or an interim spectrum plan if GLONASS operation still compromises the CDMA spectrum as the systems move forward and prepare for launch. The system licenses and Commission rules should clearly define the triggering events and the adjustment mechanism. However, licensees should be permitted to construct across the entire CDMA band segment.<sup>6/</sup>

(c) The Commission should not adopt protection requirements for GLONASS that go beyond the uplink e.i.r.p. density limits adopted at WARC-92.

(d) In particular, the Commission should (i) revise footnote 731E by deleting the last sentence; (ii) revise proposed Rule 25.213(c) to clarify that the protection is limited to the

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<sup>6/</sup> The Commission has suggested 7.5 MHz for CDMA and 3.3 MHz for FDMA/TDMA systems as an interim plan. Notice at n.64. The potential need to provide a guard band for GLONASS could reduce the amount of usable spectrum for CDMA systems to an even greater extent. Ellipsat would therefore need to look closely at any such interim proposals.



applicable uplink e.i.r.p. limits (i.e., -15 dB (W/4 KHz) for frequencies used by systems operating in accordance with RR 732 and -3 dB (W/4 KHz) on frequencies not so being used); (iii) delete proposed Rule 25.143(b)(2)(iv) to substitute a quantitative, defined criterion instead of a vague "unacceptable interference" standard; and (iv) revise Rule 25.213(b) to encompass reasonable out-of-band emission limits for MSS with regard to protection of both GPS and GLONASS below 1606 MHz.<sup>7/</sup>

The comments of the aviation community, including equipment manufacturers, do not provide any legitimate basis for the overly stringent restrictions on MSS uplinks that they seek. Even assuming that GLONASS will be part of GNSS, there is no showing, for example, that GNSS' navigation capability or performance would be impaired, even if degradation were to occur to the small number of satellites operating within the MSS bands (presently three).

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<sup>7/</sup> Ellipsat supports Loral's recommendations that the appropriate limits for out-of-band emissions by MSS earth stations (in the 1610-1626.5 MHz band) should be e.i.r.p. density level of -50 dB (W/MHz) averaged over any 20 ms period. See Loral Comments at 65-73 for a more complete discussion.

C. Intra-Service Sharing Is  
An Important Prerequisite

1. Coordination Procedures  
Should be Established

All of the CDMA comments, including those of Ellipsat, stressed the importance of intra-service coordination (in the L and S-Bands) as a prerequisite for adoption of the Commission's sharing plan.<sup>8/</sup> While the CDMA systems indicate that sharing is feasible, the comments emphasize the importance of establishing appropriate coordination mechanisms and procedures.<sup>9/</sup>

The January 1993 Joint Proposal submitted at the beginning of the negotiated rulemaking provides a basis for full band interference sharing. As proposed in that filing, and elaborated upon in the comments, coordination agreements would be based on mutually agreed values for baseline parameters, including downlink PFD spectral density, EIRP area/spectral density, polarization, frequency plans, code structures and associated cross-correlation properties, antenna beam patterns, signal burst structures, overall interference allowance into both ground and space receivers, power control capabilities in both links.

While the general coordination principles are stated in the Joint Proposal, Ellipsat agrees with other parties that the

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<sup>8/</sup> See Ellipsat Comments at 22-23.

<sup>9/</sup> See, e.g., Constellation Comments at 27; Loral Comments at 60-62.

Commission must adopt specific timelines and "default" criteria to minimize the potential use of the coordination process to delay competitors. Ellipsat agrees that the exchange of system information by the parties would facilitate coordination and is willing to engage in a dialogue with other systems for that purpose. However, formal coordination procedures cannot begin until the applicants submit conforming amendments after adoption of the new rules.<sup>10/</sup>

## 2. Mask Specifications Should Not Be Adopted

In its comments, Motorola proposes that licensees be required to use a "mask" specification that would limit emissions from the CDMA systems in Motorola's band segment and vice versa. This mask would consist of fixed out-of-band power limits at

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<sup>10/</sup> Loral proposes that coordination information be provided immediately to companies proceeding under a 319(d) waiver. This is not feasible. Until final rules are adopted by the Commission, however, system parameters cannot be finalized.

fixed frequency offsets from the band edge (or the boundary between the LEO MSS band segments). Based on Ellipsat's preliminary analysis, this mask could impose an additional design burden by adding size, weight and cost to user terminals.

There is insufficient information in the comments for Ellipsat to assess the need for mask specifications or the impact on the CDMA systems. When further information is obtained, Ellipsat will file supplemental comments addressing this issue, if and as necessary. On the limited information now available, however, Ellipsat has serious concerns about any conditions that would further reduce the usable spectrum available to the CDMA systems and increase their design burden.

D. Equitable Spectrum Reassignment  
Policies Should Be Adopted

In the Notice, the Commission proposes to reassign underutilized spectrum. Ellipsat agrees with the concept that operating systems should be provided with expansion room. However, there are serious flaws in the Commission's approach, which were also noted by other parties.

Most importantly, the Commission provides for reassignment of underutilized CDMA spectrum, but not for reassignment of unused FDMA/TDMA spectrum. There is broad agreement in the comments that the reassignment of spectrum must apply equally to both access techniques.

In addition, the Commission does not adequately define the circumstances which would trigger a reassignment of spectrum. To protect licensees, spectrum should not be reassigned without an affirmative finding by the Commission that the band is underutilized (e.g., none of the licensed systems has been implemented), a showing of need for the additional spectrum, and a demonstration that the reassignment would not have an adverse impact on the existing operator in terms of loss of service.<sup>11/</sup> Existing operators should have priority in this regard over new entrants in obtaining the reassigned spectrum.

If the CDMA systems are operating in reduced spectrum as the result of the GLONASS situation this factor will, of course, need to be taken into consideration before any reassignment of spectrum is made. Indeed, in that case, no spectrum should be made available for reassignment until the GLONASS issue is resolved.

E. Full S-Band Spectrum Must Be Available

In its opening comments, Ellipsat indicated that full-band sharing of the S-Band for CDMA downlinks is a pre-requisite.<sup>12/</sup> The comments overwhelmingly support this position. As detailed

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<sup>11/</sup> The Commission should not allow a reassignment to occur merely on the basis of a missed milestone, without the affirmative finding proposed here and in the comments of other parties. See TRW Comments at 178-79.

<sup>12/</sup> Ellipsat Comments at 26-27.

in the comments, CDMA systems must have access to the entire allocated downlink band in order to operate effectively at minimum cost and maximum capacity.<sup>13/</sup> The comments further demonstrate that 16.5 MHz is the minimum amount of spectrum needed for commercial operation, regardless of the number of systems that are operating. Use of the S-Band spectrum is already subject to constraints because of PFD limits, and the need to share with other services and systems. The spectrum should not be further constrained in the unanimous view of the LEO systems, particularly where there is no apparent reason to do so.

### III. THE COMMENTS OVERWHELMINGLY SUPPORT LIMITATION OF THE BAND TO NON-GEOSTATIONARY SYSTEMS

In its opening comments, Ellipsat urged the Commission to adopt the proposed threshold requirement of non-geostationary system architecture.<sup>14/</sup> The comments of other parties overwhelmingly support limitation of the band to LEO systems.<sup>15/</sup>

As detailed in the comments, the exclusion of geostationary systems is a threshold eligibility criterion that is reasonably based on substantial public interest benefits including (1) the

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<sup>13/</sup> See Constellation Comments at 28-29; Loral Comments at 32-37, Technical Appendix, Section 1.1.

<sup>14/</sup> See Ellipsat Comments at 17-21.

<sup>15/</sup> See, e.g., Comments of TRW at 11-20; Comments of Constellation at 15-18; Comments of Loral at 11-19.

need for tight coordination to facilitate sharing of the limited spectrum resource;<sup>16/</sup> (2) the ability of non-geostationary MSS systems to provide new, innovative and publicly beneficial services; (3) the public interest in encouragement of competition in the MSS market and competitive entry by multiple satellite systems; and (4) the availability of exclusive spectrum for GSO MSS in other bands in contrast to the limited availability of LEO spectrum.

The comments contain abundant evidence of the substantial technical, economic and social benefits offered by low-Earth-orbit satellite systems.<sup>17/</sup> As detailed in the comments, Big LEO MSS systems will introduce ubiquitous, cost-effective mobile telecommunications services, to hand-held and vehicular units, in the United States and worldwide. LEO services could prove of particular benefit to developing countries by enabling them to bring voice and data services, at reasonable cost, to presently non-served areas.

In addition, the global MSS networks will provide benefits to the aerospace and telecommunications industries, in terms of employment and economic growth. Westinghouse Electric estimates

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<sup>16/</sup> See Final Decision on Remand, GEN Docket No. 84-1234, 7 FCC Rcd. 266, 273 (1992), finding this rationale a legitimate ground for excluding a LEO MSS system from the GSO MSS Band.

<sup>17/</sup> See, e.g., Motorola Comments at 2-16; Loral Comments at 12-19; Constellation Comments at 5-7.

in its comments that, by the year 2004, annual revenues for the MSS service and product market will be between \$20-30 billion.<sup>18/</sup>

As further detailed in the comments, LEO satellites are better suited to provide global MSS service to hand-held terminals. Geostationary satellites require the use of larger antennas and heavier terminals to receive an adequate signal. The lower orbits of the LEO satellites permit the use of lower power for transmissions, and avoid the transmission delay found with GSO satellites.

In addition to the unique benefits of the LEO technology, the comments point to long-standing competitive entry policies as an additional reason for the LEO requirement. The comments of other parties in this proceeding share Ellipsat's concern as to the inherent inequity of allowing AMSC to seek licensing in the LEO MSS band when it now holds an exclusive license in the 1.5/1.6 GHz band (and has access to 68 MHz of conventional MSS spectrum). Limitation of the band to LEO systems would encourage new entrants and provide competition in the provision of MSS services. This public benefit provides an additional, legitimate basis for excluding geostationary systems in the L-Band spectrum.

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<sup>18/</sup> See Westinghouse Comments at 5. See also Harris Comments at 6-7.



IV. THE COMMENTS UNDERScore THE NEED  
FOR ADEQUATE FEEDER LINK SPECTRUM

The opening comments underscore the LEO's pressing need for adequate feeder link spectrum. As more fully discussed in Ellipsat's comments, sufficient feeder link spectrum below 15 GHz is a mandatory requirement for system implementation.<sup>19/</sup> Of particular concern, the Commission's failure to identify adequate spectrum below 15 GHz could penalize systems that use multiple ground switching networks. The Commission must therefore continue to place a high priority on identifying feeder link spectrum for the CDMA systems below 15 GHz.<sup>20/</sup>

Although the Notice identifies several options for feeder link spectrum below 15 GHz, these would provide an insufficient amount of spectrum to meet the needs of Ellipsat and the other CDMA systems. Ellipsat's feeder link spectrum requirements vary depending upon a number of factors including ability to use multiple beam feeder link antennas, the number of beams and the amount of bandwidth required for each beam. Ellipsat currently

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<sup>19/</sup> See Ellipsat Comments at 24-26.

<sup>20/</sup> As detailed in Ellipsat's comments, and those of Loral and Constellation, use of the Ka-Band is not an attractive option for feeder links. Among the concerns raised in the comments are: the rain attenuation problem, the lack of equipment to utilize the Ka-Band (which will need to be developed), the added weight (and cost of Ka-Band antennas) and the competing demands for Ka-Band spectrum by other systems and services. In addition, use of the Ka-Band will be less efficient because more spectrum will be required for feeder links than would be the case in other bands.